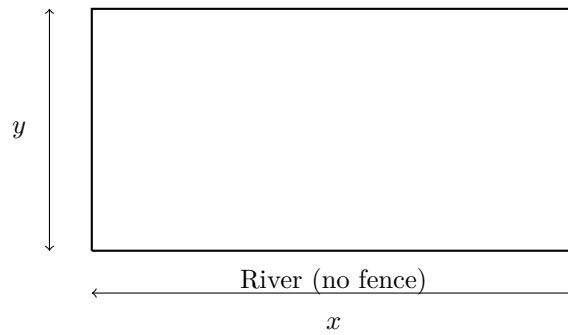


Question 4**Problem:**

A farmer wants to build a rectangular fence next to a straight river. No fencing is needed along the river. The farmer has 240 meters of fencing available.

- (a) What dimensions will maximize the area of the enclosure?
- (b) What is the maximum area that can be enclosed?

Diagram:

Question 4 - Solution

Let: - x : length of the fence parallel to the river (only 1 needed) - y : width of the fence perpendicular to the river (2 needed)

Fencing constraint:

$$x + 2y = 240 \quad \Rightarrow \quad x = 240 - 2y$$

Area:

$$A = x \cdot y = (240 - 2y)y = 240y - 2y^2$$

Differentiate:

$$A'(y) = 240 - 4y$$

Set derivative to 0:

$$240 - 4y = 0 \quad \Rightarrow \quad y = 60$$

$$x = 240 - 2(60) = 120$$

(a) Optimal Dimensions:

$$x = 120 \text{ m}, \quad y = 60 \text{ m}$$

(b) Maximum Area:

$$A = x \cdot y = 120 \cdot 60 = 7200 \text{ m}^2$$